Capital and Sustainability

Roger Wyse
Burrill & Company
San Francisco, CA

I will provide an investor's perspective on the dramatic changes occurring in agriculture. At Burrill & Company, we invest across the life sciences—in therapeutics and drugs, industrial biotechnology, agriculture, and health and wellness. From my perspective, much of the innovation coming from universities and going into early-stage companies is where the innovation will occur to enable the area of industrial biotechnology as a whole, of which biofuels is one part. At Burrill we have ~$850 million and we have a banking group that's assisting companies in doing deals across the life sciences—a merchant banking operation. In terms of current funds, we are investing about half of our portfolio, ~$400 million, which we expect to increase to ~$1 billion in the near future. It's a significant amount of capital to be investing. I will provide the perspective of our obligations to our investors as we look now at opportunities to invest in the emerging area of industrial biotechnology.

Sustainable Area for Investment

The most important question is, "Will this be a sustainable area for investment?" It's gotten frothy very quickly. So, as we go forward, where will the money come from? Where will the certainty needed to make investments come from? What is the regulatory environment going to look like? Investors abhor uncertainty. There is a misperception that venture capitalists invest in high-risk companies. We don't. We try to avoid all the risk possible. One of the unknowns in this area is the regulatory/policy environment and if that uncertainty persists, money that has been flowing into this industry will begin to flow elsewhere.

Tipping Point

In 2005, industrial biotechnology hit a tipping point and the ride since has been interesting. Obviously it caught attention, all the way up to President Bush, who commented on it in his 2005 state-of-the-union address. In California, Governor Schwarzenegger has taken the lead in making significant investments to reduce emission of greenhouse gases. These developments are all about energy security and politics, in particular rural politics. The price of oil rose dramatically whereas the price of corn stayed the same, ~$2/bushel, as it has been for many years. That discrepancy provided the incentive for rural politics to engage, to begin looking at options for increasing the value of the commodity crops that we produce. The other factor was global security of the oil supply; many of the countries from which the United States purchases oil are in political turmoil. Then Katrina struck and revealed additional insecurities in US refining capacity. All of this happened at about the same time and then suddenly "green" became politically correct.

I have been concerned for some time that industrial biotechnology is long on technology and short on markets. A good example in the Midwest is the Dow-Cargill joint venture, NatureWorks LLC, with almost a billion dollars spent in developing the technology and the plant in Blair, NE. That plant had economic problems until Wal-Mart said, "We're going green. We're going to use your product for disposable packaging for the future." Suddenly that plant looks like a much more economically viable investment. This example demonstrates that you can have all the technology in the world but market timing is important.

So, around 2005 there was a perfect storm. We had enabling technologies in the United States in various energy bills and the ag bill, and in the European Union, policies were put in place favoring biodiesel, for example. Much technology had been developed and we'd sequenced a lot of organisms. We understood how to convert plant-made feedstocks into valuable commodities and market-pull came in, enabling things to happen fast. Some would argue that things happened almost too fast. There was a rapid increase in the number of ethanol plants, as was expected. A significant fraction of the US corn crop is going into ethanol production, corn prices have risen dramatically and we are now in a debate about feed vs. fuel. Additionally, investors saw this as an opportunity. The "cleantech" guys had been looking at alternative-energy investments for a number of years and suddenly there was a dramatic shift of equity capital into this space.

Rural Revitalization

Rural America is uniquely energized. I met with a farm-credit group recently, considering putting money into venture capital to invest in rural America—the revitalization occurring in the Midwest is amazing. I gave a talk in Wall Street a while back and made the argument that ethanol was getting too frothy, that they should invest in John Deere, considering what farmers do when they make a lot of money—they buy a new tractor or pick-up truck and they remodel their wife's kitchen. The implications for us have been dramatic both in rural development as well as in terms of companies developing technologies and bringing new products to market.

An important point is that this is not just about energy. We are looking at dramatic growth in the area of industrial applications of biotechnology. The Mackenzie reports have talked about a $500 billion increase in the chemical industry, half coming from inputs from biotechnology. So, a lot will happen outside the area of biofuels and we have the technologies in hand to make those changes. There will still be improvements, but we can now move into those areas as well. It's all about the economics.

Another important aspect is that when we invest in a company, we work hard to grow its value. However, until we can exit that company, until we can sell it to some larger company or until we can take it public, it's not a good investment for us. Public markets have gotten very interested in alternative energy and sustainability. Metabolix was a small company that developed a technology for production of plastics in plants and via fermentation; after a deal with ADM, they announced that they had a name for their product and their stock price went up dramatically. The markets are beginning to look at this area as important space and they are looking also at John Deere, Monsanto, *etc*.—the people who are investing in it—and their stock prices are growing nicely as well.

Investment Cooling Off

However, the biofuels area got a lot of frothy investment that tapered off dramatically. A lot of the ethanol plays that went into the public marketplace saw much activity, but then cooled off because of uncertainty in policy and in the price of corn. If I look at investing in an ethanol plant and see corn at around $4, that's not a good investment. Twelve percent on your money is not a venture investment. We are seeing the economic reality of these investments setting in, which will shake out over the next couple of years.

VC Investment in Innovative Companies

Another important aspect is that a large number of small innovative companies have developed. Those that have technology—or are aggregating technologies—will enable this industry into the future. A few of those small companies are listed in Table 1. For example, LS9 is Chris Somerville's in conjunction with Jay Keasling. They are putting genes from plants into microorganisms, enabling new pathways for exploitation in fermentors. Khosla Ventures—in the newspapers almost every day—is one of the funding sources. Another biotech company is Amyris, a spin-out from Berkeley, that has put the isoprenoid pathway into *E. coli*, achieving high levels of production for use as an anti-malaria drug. This is another Khosla investment. Muscoma, a company converting cellulose for ethanol production, recently raised $30 million.

Today's innovations, which will be tomorrow's enabling technologies, are attracting venture-capital investments to such an extent that we are almost back to the "dot-com" era. Some technologies coming to us are still in the laboratory stage. Recently we saw a conversion technology for glycerol, with proof-of-concept in an Erlenmeyer flask and they were talking about pre-money valuations of somewhere around $8 million, whereas it's probably a $500,000 value at that state. So, things are getting frothy again, and people like us are going deep into universities to find technologies that can be put into companies. At Burrill we are very cautious about the kinds of things we are looking for and looking at.

Table 1. New companies formed and funded by venture capital.

Company	Location	VC source	Funding to date ($ million)
LS9	San Carlos, CA	Flagship Ventures Khosla Ventures	5
Amyris Biotechnologies	Emeryville, CA	Khosla Ventures KPCB, TPG	20
Mascoma, Inc.	Cambridge, MA	Atlas, Flagship General Catalyst KPCB, Pinnacle VPVP, Khosla	30
Seattle Biodiesel	Seattle, WA	Nth Power Technology Ventures Vault Capital Vulcan Capital	7.5
Aurora Biofuels	Alameda, CA	Noventi Oak Investment	3.2
Greenergy	London, UK	Cargill	(25% equity)
E3 Biofuels	Mead, NB	Unknown	
Mission Biofuels	Malaysia	Unknown	
Southern Biofuels	Jackson, MS	N/A	10
Earth Biofuels	Dallas, TX	Apollo, Cornell Downsview, Evolution Heights, Polygon Kamunting, Ramius RG Capital, Sandell	52.5
United Biofuels	York, PA	Agrifuel	

To provide perspective, $25 billion were invested in 2006 across all ventures, including the life sciences, IT and high tech. About $5 billion of that went into biotechnology. In Fig. 1 I haven't dissected out of the cleantech sector, what was bio and what was solar, fuel cells, wind, *etc*., but there has been dramatic growth in cleantech, exceeding $2.9 billion in 2006. We are on track for around $4.5 billion in 2007—a tremendous movement of capital into this space. Revenues from the biotech industry approached $100 billion in mid-2007. The amount coming out of industrial biotech is in the $20–30 billion range. Clearly, in a couple of years, revenues from industrial biotechnology will exceed those from traditional biotech, which have been related chiefly to drug development and healthcare.

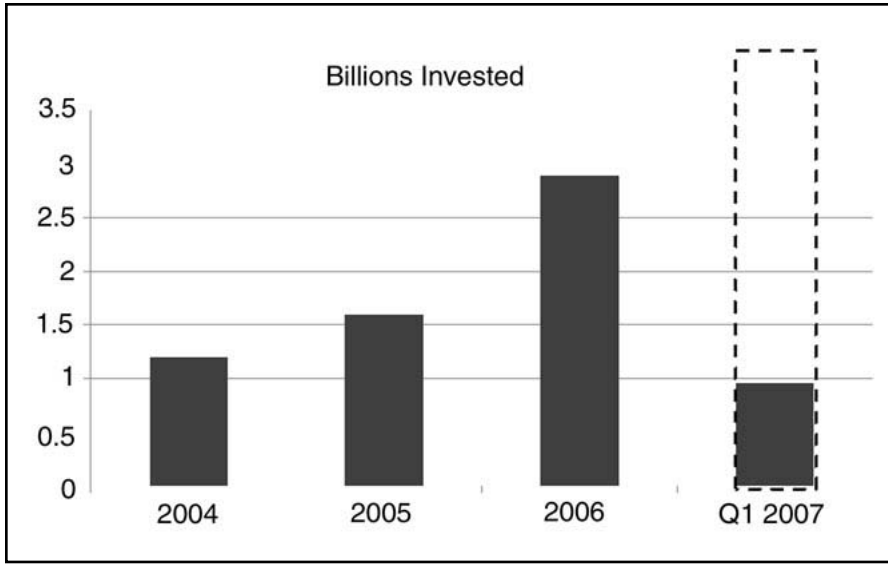

Figure 1. Venture investments in cleantech are growing rapidly; total venture investments in 2006: $25 billion, biotech VC: $5 billion.

Challenges

The real question for us on a daily basis as we look at investment opportunities is: is this all sustainable from an investment standpoint? I think that food vs. fuel will continue to be an issue—it's getting prominent play today. Is all this change too disruptive? When I talk to farmers, they say they are making money off the ethanol plant they invested in, but they are losing on the livestock side because of high costs of feed. Don't discount challenges we have had with monoculture of corn in the Midwest. If we grow wall-to-wall corn, also using stover to make cellulosic ethanol, we may be heading for an ecological disaster. I still think corn is the right source of feedstocks for the industrial area but it may not be corn grown in the Midwest.

At a broader conference we'd be talking about wind, solar, fuel cells—even nuclear—as other options for investment. The bio-area has gotten very frothy for obvious reasons, but we have to think about the competition. As prices rise, investment money is going to move elsewhere, where it's already getting attention. However, a lot of people, including myself, think it will be sustainable. I think we've seen a real change in how we are going to approach sustainability. Bill Joy, one of the founders of Sun Microsystems with Vinod Khosla—a very aggressive investor in this space—stated recently at a cleantech forum in Germany: "A global response to climate change will spur a business revolution bigger than the internet." This effect will be particularly dramatic in the chemicals industry and much greater than it has been in the area of healthcare.

In Summary

Biotechnology—the underlying understanding of life processes that can be applied in the industrial area—has reached the point where we can be efficient and effective in implementing technologies for solutions in the industrial area. The technology is in place and we will continue to improve it, and markets are there now and ready for the products. Things are in alignment and there will be a long-term investment play. We're going through a frothy period, but it will settle out in a few years and stabilize with policies in place. We'll understand the markets and it will be a long-term and exciting place to be.

Roger Wyse is managing director and general partner of Burrill & Company, a life-sciences merchant bank and leading venture-capital firm located in San Francisco. He joined Burrill in 1998 and has led the development of its agriculture, nutraceuticals, health and wellness, and industrial biotechnology-related activities in venture capital investing, partnering and the spinout of technology from large companies. The firm has over $850 million under management.

Dr. Wyse chairs or serves on the boards of eleven private companies. He is co-chairman of the newly formed $150 million Malaysian Life Capital Fund, and is a member of the International Advisory Panel for Biotechnology (BioIAP) for the prime minister of Malaysia. He was founder and chairman of the Alliance for Animal Genome Research.

Immediately prior to joining Burrill, Wyse served for 5 years as dean of the College of Agricultural and Life Sciences at the University of Wisconsin-Madison, and from 1986 to 1992 he served as dean of research at Rutgers University.

His basic studies in plant biochemistry produced more than 150 scientific papers. He received the Arthur Flemming Award in 1982 as the Outstanding Young Scientist in the US Federal Service, and was elected a fellow of both the Crop Science Society of America and the American Society of Agronomy.